

**THERMAL BARRIER COATINGS WITH PROTECTIVE OUTER LAYER FOR
IMPROVED IMPACT AND EROSION RESISTANCE**

ABSTRACT

[0035] A reduced thermal conductivity thermal barrier coating having improved impact and erosion resistance for an underlying metal substrate of articles that operate at, or are exposed to, high temperatures. This coating comprises an inner layer nearest to the underlying metal substrate comprising a ceramic thermal barrier coating material, as well as a protective outer layer adjacent to and overlaying the inner layer and having an exposed surface. The outer layer has a thickness up to about 5 mils (127 microns) sufficient to impart impact and erosion resistance to the thermal barrier coating, and comprises a zirconia-containing ceramic composition having a c/a ratio of the zirconia lattice in the range of from about 1.011 to about 1.016 and stabilized in the tetragonal phase by a stabilizing amount of a stabilizing metal oxide selected from the group consisting of yttria, calcia, ceria, scandia, magnesia, india, ytterbia and mixtures thereof. This coating can be used to provide a thermally protected article having a metal substrate and optionally a bond coated layer adjacent to and overlaying the metal substrate. The thermal barrier coating can be prepared by forming the inner layer comprising the ceramic thermal barrier coating material, followed by forming on the inner layer the protective outer layer.